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Drosophila Survey of Hokkaido, XXXVIII*.

Seasonal activity of drosophilid flies observed at Lake Kutcharo, near the coast of Sea of Okhotsk[1)]

Haruo Takada and Hiroshi Maekawa[2)]

During the last thirty years, investigations into the distribution of the Family Drosophilidae, Diptera, have made striking progress in Japan, and particularly a great amount of more than sixty data have so far been accumulated for Hokkaido, northernmost island of Japan (Takada 1952, '54, '57, '58, '59, '60, '68, '71; Momma & Takada 1954, Momma 1956, '57; Okada 1956; Ishihara 1955a, 55b; Wakahama 1956, Wakahama & Okada 1958, Wakahama, Kaneko & Tokumitsu 1963; Takada & Okada 1958, '60; Toyofuku 1958, Toyofuku & Y. Kimura 1961; Kaneko 1960, '68, Kaneko & Shima 1962, Kaneko, Tokumitsu & Takada 1964, Kaneko & Takada 1966, Kaneko, Kawakami & Takada 1966, Kaneko, Tokumitsu & Takada 1966, Kaneko, Tokumitsu & Shima 1968, Kaneko, Momma & Tokumitsu 1969 ; Takada & Toda 1973; Kimura M. 1976, '76b; Beppu 1976, '78; Watabe & Beppu 1977, Watabe 1977, Watabe & Higuchi 1979 ; and Takada, Beppu & Toda 1979).

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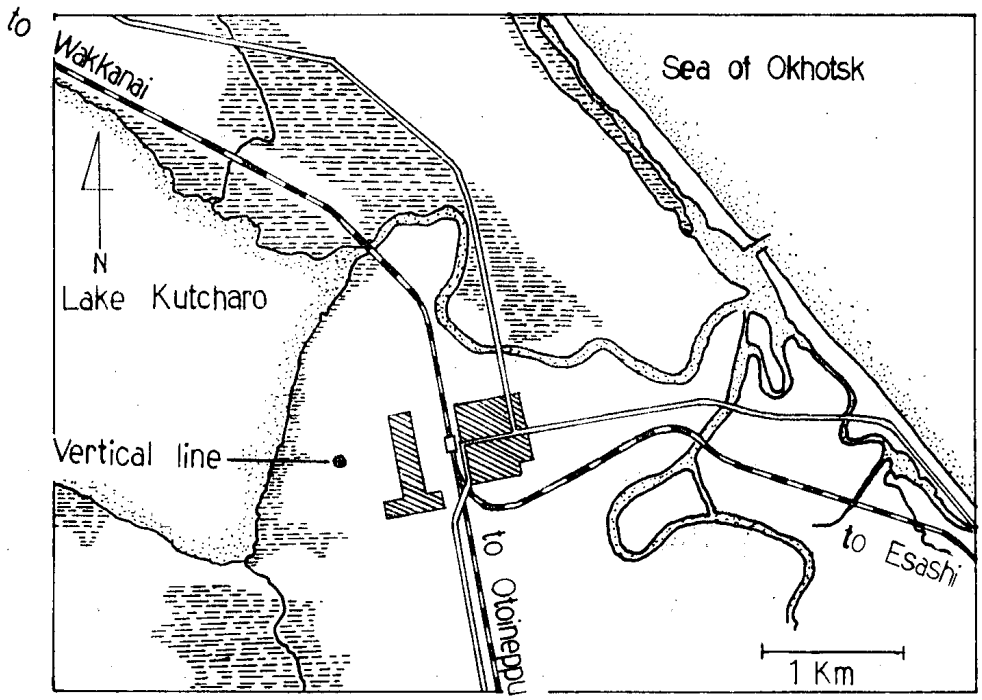
*There have been two XXXVI's, thus omitting XXXVII and numbering this present paper XXXVIII.



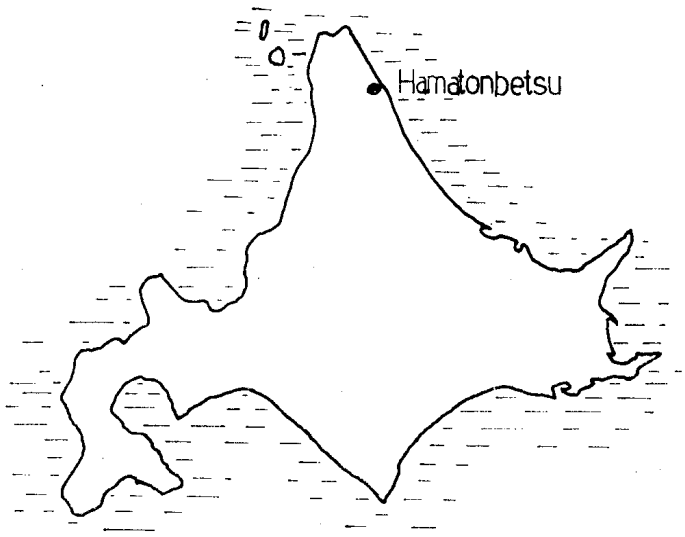


Fig. 1. Maps showing Hokkaido (left) and Hamatonbetsu (right). Relative position of the collecting stations are shown with black spots.

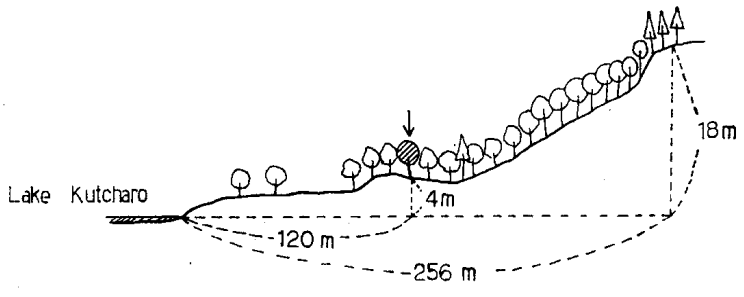


Fig. 2. Sectioned view of collecting place, Lake Kutcharo, Hamatonbetsu. Arrowheaded area indicate trapping sites.

At the present time data have been accumulated indicating that the member of species known to occur in Hokkaido approximates one hundred and eight.

The junior author and his pupils has continued the collection of drosophilid flies with yeasted banana-baits and net-sweeping in a side of Lake Kutcharo, at Hamatonbetsu (45°08′ N., 142°21′ E.), the coast of Sea of Okhotsk, Hokkaido, Japan, during a period ranging from May 1 to November 15, 1981 and from May 1 to November 11, 1982, resulting in the capture of a total of 20705 drosophililid flies including five genera and forty-six species.

Meteorogical study and its method

During the period from May 1 to November 15, 1981, junior author had daily determined the maximum and the minimum temperature, with the temperature and humidity before sunset from 4 : 30 p. m. to 6 : 30 p. m.

Collections were made largely through the use of a Makino's

retainer trap (Takada & Makino 1981) with fermenting banana bait and suspended by strings on the branches of an alder (*Alnus hirsuta*) tree, two meters high from ground were collected every third day in this period. And, some small scale net-sweeping of bush at just around the trapping places caught many specimens.

It snowed on May 29, which had not been recorded till then, and heavy rain twice in August, snow at the end of October and heavy one in November here in 1981. Comparing to the average record of past ten years, it rained much during May, July, August and September in 1981, especially the whole precipitation in August was 290 millimeters, which was over twice than the average. And this seems to cause the high humidity in the collection season.

During from May 1 to November 11, 1982, junior author had determined the temperature and humidity in the same way as in 1981. Specimens by the same trap site about two meter shigh on the same alder tree were collected every three days in this period. Moreover, collected specimens by a trap set 7.5 meters high on the same alder branche from August 1 to September 24, and with netsweeping for occasion.

It snowed a little on November 2, 1982. The precipitation from May to November in 1982 was less than in 1981 and the average year. It seems to cause the low humidity in 1982.

Fermenting banana baits in a trap were renewed every fifth day in 1981 and 1982. Net-sweeping were made around hunged cans (made by big beer-can) with baits in bushes every five days in both years. The collected specimens were reserved in 70 % alchohol, and identified under a binocular microscope.

Collection Records

In 1981, the total of 18256 specimens were obtained by a trap and net-sweeping. They represent five genera and 39 species.

In 1982, the total of 2027 specimens were obtained by the same trap as in 1981 and with net-sweeping. They represent four genera and 25 species. And the total genera and 17 species (Table 1 & 2).

A total of 18000 specimens were collected in 1981, and about 2000 specimens in 1982. For some species such as *Amiota conifera takadai*, *D.confusa* and *D.*suzukii, each number of the collected specimens in 1982 is nearly equal to the result of 1981. But it has an idea that drosophilid flies might be generated in great quantities in 1981, and the weather might cause this increase of them. The temperature in 1982 was higher a little than that of 1981 throughout the two collection seasons. The daily humidity from June to August in 1981 were over 90 %, particularly in most days from july to August, they were over 95 %. In 1982, it has few days; the humidity was over 95 % and even 85 % from June to July. This high humidity in 1981 might cause the increase of drosophilid flies. But the generation of *A.* conifera *takadai*, *D. confusa* and *D. suzukii* might not be affected by this high humidity. On the other hand, the low humidity in 1982 might cause drosophilid flies to decease slightly.

D. testacea van Roser: A total of 8376 specimens were collected in 1981 and only 25 in 1982, both by a trap set two meters high. We cannot explain this results simply by these data.

D. confusa Staeger: A total of 695 specimens were obtained in 1981 and 728 in 1982, both by a trap set two meters high.

Species	1981 by a trap 2 m high	1982 by two traps 2 m	1982 by two traps 7.5m
A. conifera takadai	84	58	20
A. stylopyga	4	0	0
A. taurusata	1	0	0
A. albilabris	0	1	0
A. other species (female)	2	1	1
L. quinquemaculipennis	7	0	0
L. maculata	2	0	0
Ch. caudatula	0 (1)	2	0
Ch. costata	0	1	0
Ch. nigrimana	3	0	0
Sc. graminum	2 (1)	0	0
Sc. amplialata	0	0	0 (1)
Sc. pallida	1	0	0 (4)
Sc. okadai	0	0	0 (1)
D. alboralis	1	1	0
D. trivittata	2	0	0
D. sexvittata	10	0	0
D. confusa	695	728	6
D. busckii	8	0	0
D. coracina	11	0	2
D. throckmortoni	20	9	2
D. puncticeps	3	0	0
D. melanogaster	0	5	4
D. suzukii	13	39	33
D. clarofinis	0 (1)	0	0
D. biauraria	0	1	0
D. bifasciata	2,395	1,029	322
D. imaii	8	1	2 (1)
D. ambigua	4	9	4 (4)
D. funebris	6	2	1
D. multispina	1	0	0
D. lacertosa	90	6	0
D. moriwakii	81	1	0
D. okadai	10	0	0
D. pengi	16	23	17
D. ezoana	7	0	0
D. immigrans	3	0	5
D. testacea	8,376	25	0
D. bizonata	18	0	0
D. nigromaculata	64 (13)	3	1
D. brachynephros	786	12	0
D. unispina	413	2	0
D. kuntzei	1	0	0
D. histrio	5,077	57	2
D. tenuicauda	4	0	0
D. makinoi	11	0	0
Total	18,240 (16)	2,016	422 (11)
		2,438	

Numbers in ( ): Collected flies by net sweeping

Table 1. Collection Records of Drosophilidae in 1981 & 1982.

Species	May.		Jun.		Jul.		Aug.		Sep.		Oct.		Nov.		Total	
A. conifera takadai	1	(0)	0	(0)	0	(0)	6	(18)	37	(52)	14	(14)	0	(0)	58	(84)
D. buscki	0	(0)	0	(0)	0	(0)	0	(3)	0	(3)	0	(2)	0	(0)	0	(8)
D. confusa	12	(1)	404	(5)	282	(11)	22	(279)	5	(155)	3	(222)	0	(22)	728	(695)
D. bifasciata	1	(0)	108	(0)	412	(778)	344	(1,376)	139	(132)	25	(92)	0	(14)	1,029	(2,395)
D. ambigua	0	(0)	0	(0)	2	(4)	2	(0)	1	(0)	4	(0)	0	(0)	9	(4)
D. imaii	0	(0)	0	(0)	0	(2)	0	(6)	1	(0)	0	(0)	0	(0)	1	(8)
D. melanogaster	0	(0)	0	(0)	0	(0)	3	(0)	1	(0)	1	(0)	0	(0)	5	(0)
D. suzukii	0	(0)	0	(0)	0	(0)	2	(12)	11	(1)	26	(0)	0	(0)	39	(13)
D. moriwakii	0	(0)	0	(0)	1	(7)	0	(34)	0	(30)	0	(10)	0	(0)	1	(81)
D. lacertosa	0	(0)	0	(0)	0	(1)	1	(10)	1	(35)	4	(42)	0	(2)	6	(90)
D. ezoana	0	(0)	0	(0)	0	(0)	0	(4)	0	(2)	0	(1)	0	(0)	0	(7)
D. immigrans	0	(0)	0	(0)	0	(0)	0	(0)	0	(3)	0	(0)	0	(0)	0	(3)
D. testacea	4	(0)	4	(0)	4	(183)	11	(4,303)	2	(1,777)	0	(2,045)	0	(68)	25	(8,376)
D. nigromaculata	1	(0)	1	(0)	0	(9)	0	(28)	1	(15)	0	(12)	0	(0)	3	(64)
D. brachynephros	0	(0)	0	(0)	3	(3)	3	(17)	2	(157)	4	(589)	0	(20)	12	(786)
D. unispina	0	(0)	0	(0)	0	(0)	0	(1)	0	(22)	2	(374)	0	(16)	2	(413)
D. histrio	1	(0)	9	(0)	14	(10)	10	(516)	16	(2,669)	6	(1,845)	1	(37)	57	(5,077)
D. pengi	0	(0)	2	(0)	0	(0)	5	(9)	14	(7)	2	(0)	0	(0)	23	(16)
Others combined*	1	(0)	6	(0)	2	(1)	2	(37)	5	(25)	2	(55)	0	(2)	41	(136)
Total	21	(1)	534	(8)	720	(1,009)	411	(6,653)	236	(5,085)	93	(5,303)	1	(181)	2,016	(18,240)

* including *A. stylopyga, A. taurusata, A. albilabris. A.* sp., *L. quinquemaculipennis, L. maculata, Ch. caudatula, Ch. costata, Ch. nigrimana, Sc, graminum, Sc. pallida, D. alboralis, D. trivittata, D. sexvittata, D. coracina, D. throckmortoni, D. puncticeps, D. biauraria, D. funebris, D. multispina, D. okadai, D. bizonata, D. kuntzei, D. tenuicauda, D. makinoi.*

Table 2. Monthly Collected Number of Flies by a Trap Set 2 Meters High in 1981 and 1982.

A : in 1982. (B) : in 1981.

There is few differences in the number of collected flies between 1981 and 1982, but there is a clear difference in seasonal appearance. This species were collected most of them from August to October in 1981, but from May to July in 1982. The low temperature by the snowdrift on May 29 might cause the seasonal changes in 1981 to be three months later than in 1982 (Fig. 6).

D. bifasciata Pomini : The total of 2395 specimens were collected in 1981 and 1029 in 1982, both by a trap set two meters high. There are few differences in seasonal appearance 1981 and 1982. Three peaks of individual numbers were observed from July to August in both 1981 and 1982. In 1981, this species also might be affected by the snowdrift on May 29, because they could hardly collect specimens in June.

On the total of 21 specimens like *D. ambigua* Pomini, four were collected by a trap set two meters high in 1981, seventeen by two traps (set 2 m., and 7.5 m. high) and by net-sweeping in 1982.

Though it has not analized ovarian development yet, the collection records in 1981 seems to show the generation changes of *D. brachynaphoros* and *D. unispina* are uni-voltinism. These results are different from the ones reported near Sapporo City (Watabe & Beppu 1977). And the generation changes of *D. histrio* and *D. testacea* seems to be multi-voltinism, and they are equal to their results.

Summary

(1) Collections of Drosophilidae were made in the Lake Kutcharo, Hamatonbetsu, near the coast of Sea of Okhotsku, Hokkaido,

Japan during May to November, 1981 and 1982. Some of the metrorogical features of the area is described.

(2) A total 20705 specimens was obtained, mostly in two Makino's retainer traps of fementing banana.

(3) They represent five genera and forty six species. There were four unidentifiable fragments of females belonging to the genus *Amiota*.

(4) *Drosophila ambigua* Pomini have not previously been recorded from within Hokkaido, Japan and also probably a new record.

(5) A sudden decrease in numbers of *D. testacea* was experienced at 1981 and 1982 in from August to October. The most probable cause of this decrease was a rise in the amount of rainfall including scanty emergence.

(6) *D. confusa* Staeger is few differences in the seasons of collected specimens between 1981 and 1982. The most probable cause of this changes was a rise in low temperature by the snowdrift on May 29, 1981 might cause the seasonal appearance in 1981 to be three months later than in 1982.

Acknowledgments

We are indebted to officials of the Board of Education of Hamatonbetsu, for presenting of maps; to the Agricultural Experiment Station of Tenppoku for weather information. Sincere thanks are also due to Mr. Ryoichi Demachi and Members of Biological research club of Hamatonbestsu Senior High School for thoughtful and capable cooperations.

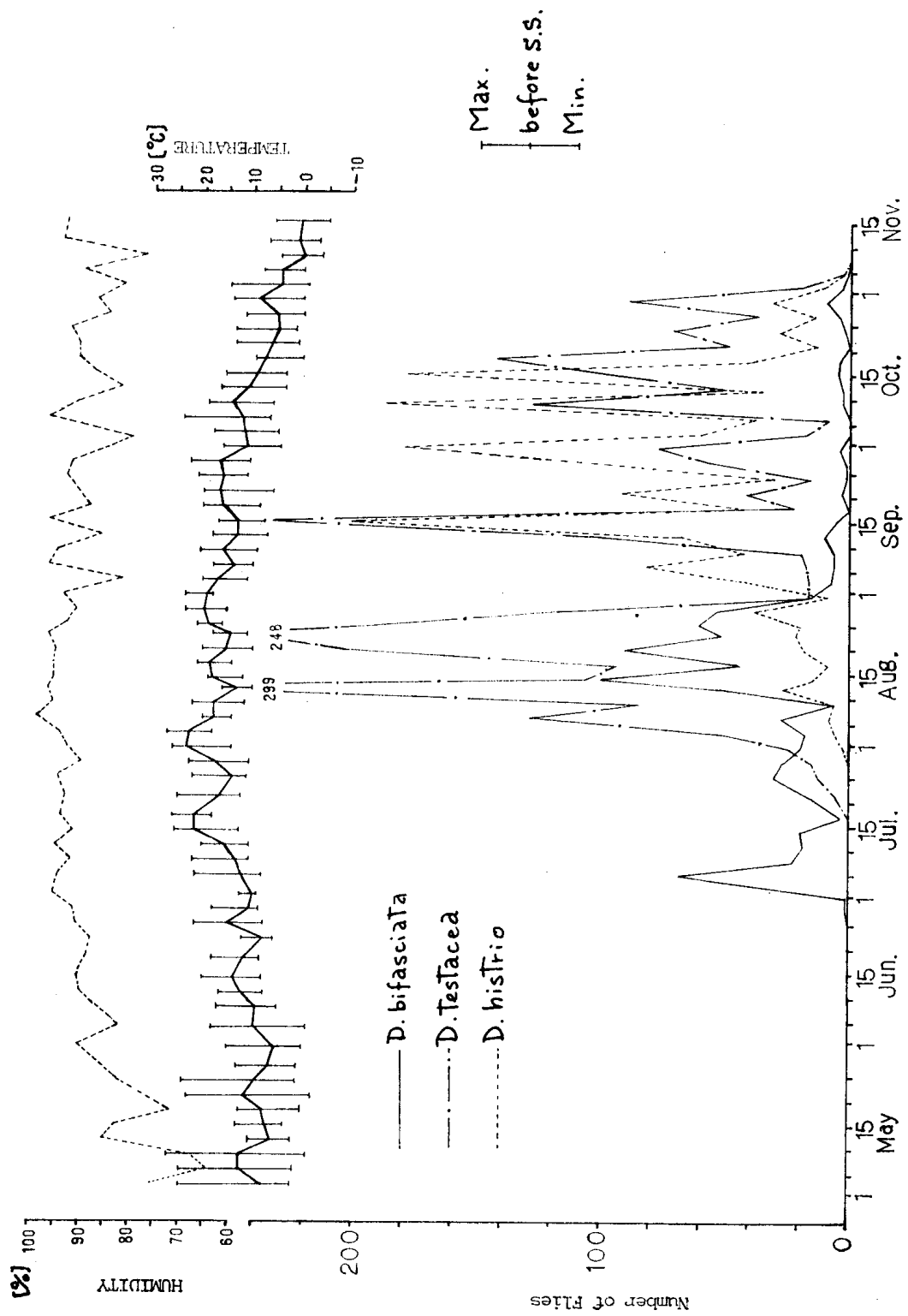


Fig. 3. Graph showing the seasonal activity of Drosophila observed in the side of Lake Kutcharo, Hamatonbetsu in 1981.

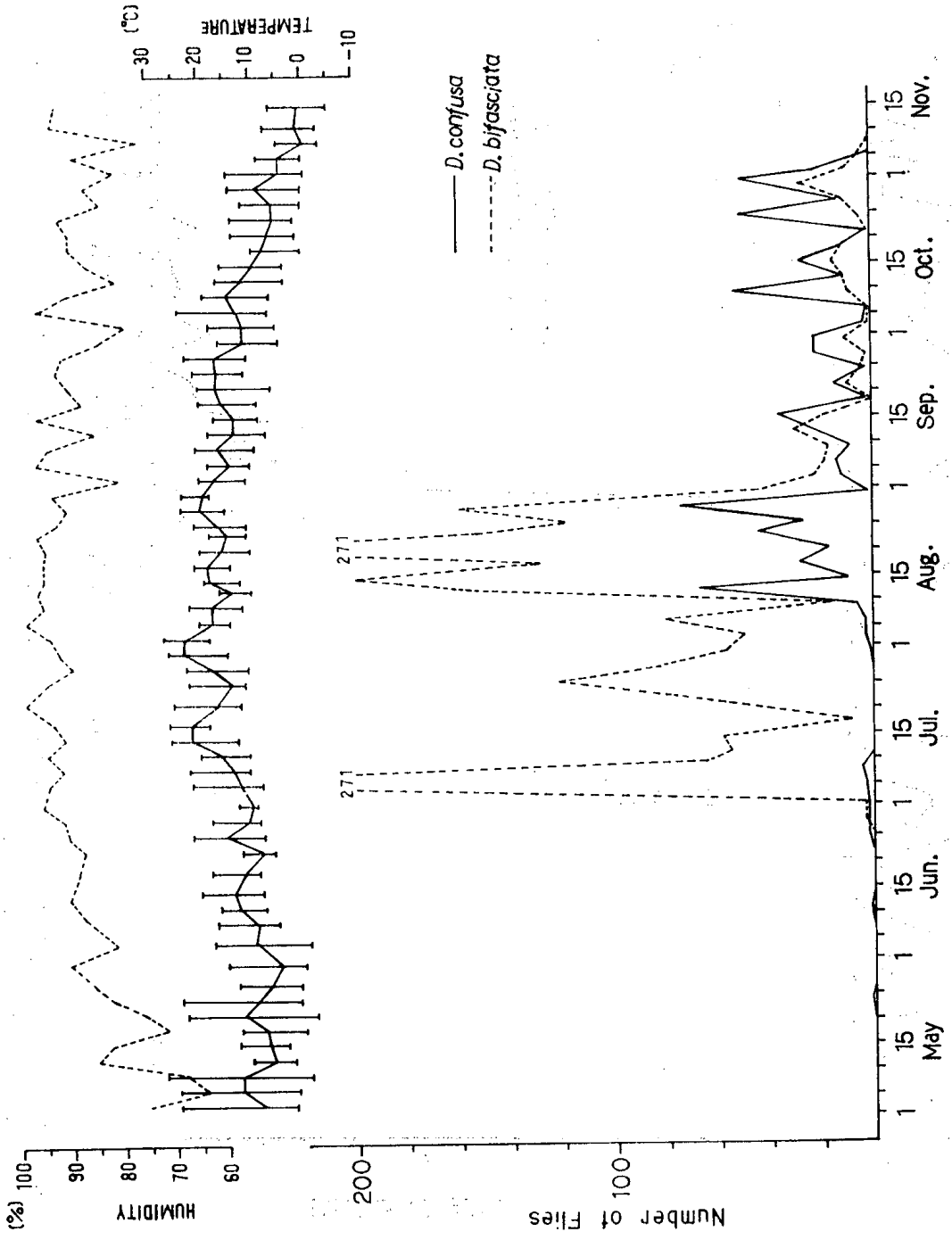


Fig. 4. Graph showing the seasonal activity of *D. confusa* and *D. bifasciata* observed in the side of Lake Kutcharo, Hamatonbetsu in 1981.

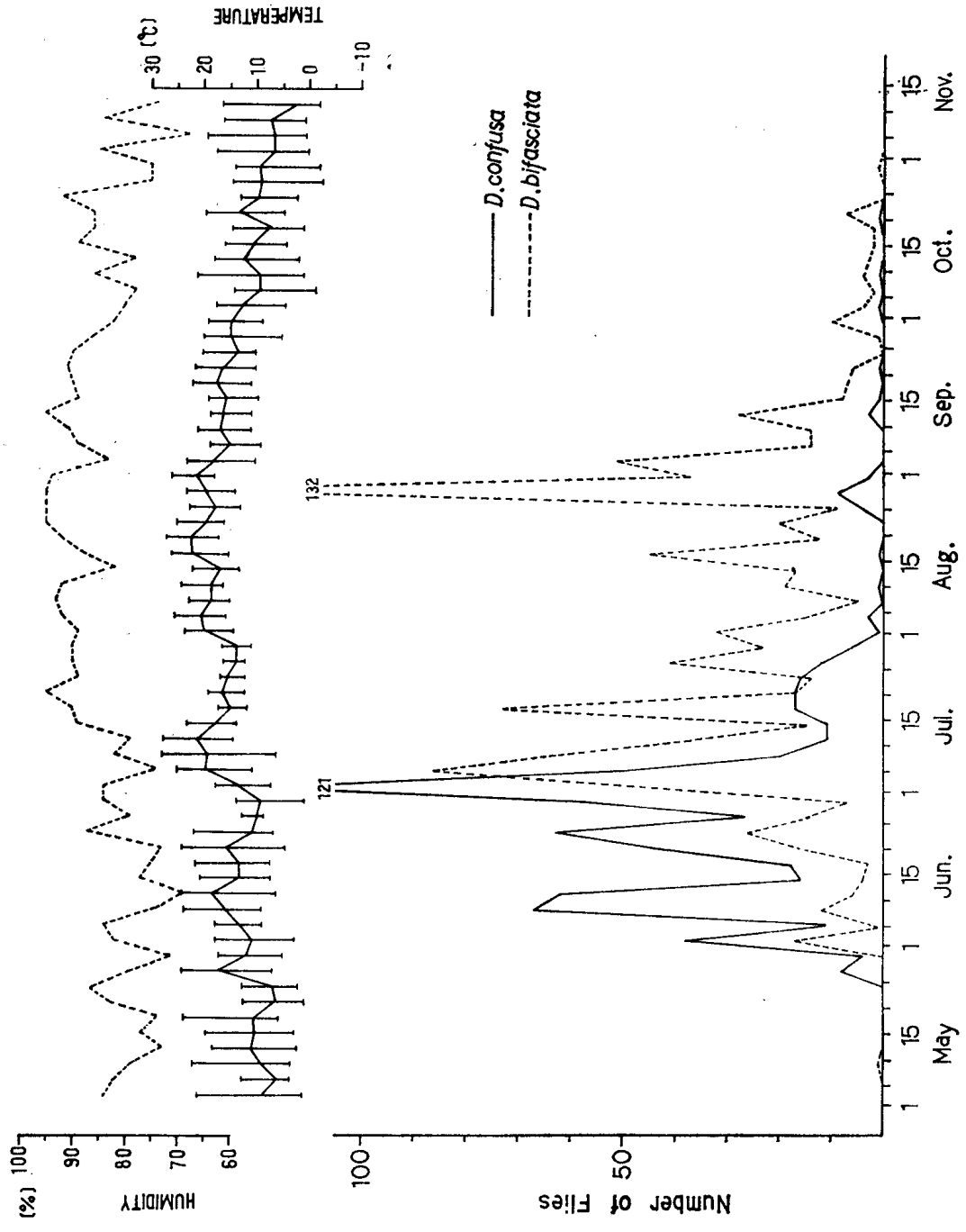


Fig. 5. Graph showing the seasonal activity of *D. confusa* and *D. bifasciata* observed in the side of Lake Kutcharo, Hamatonbetsu of 1982.

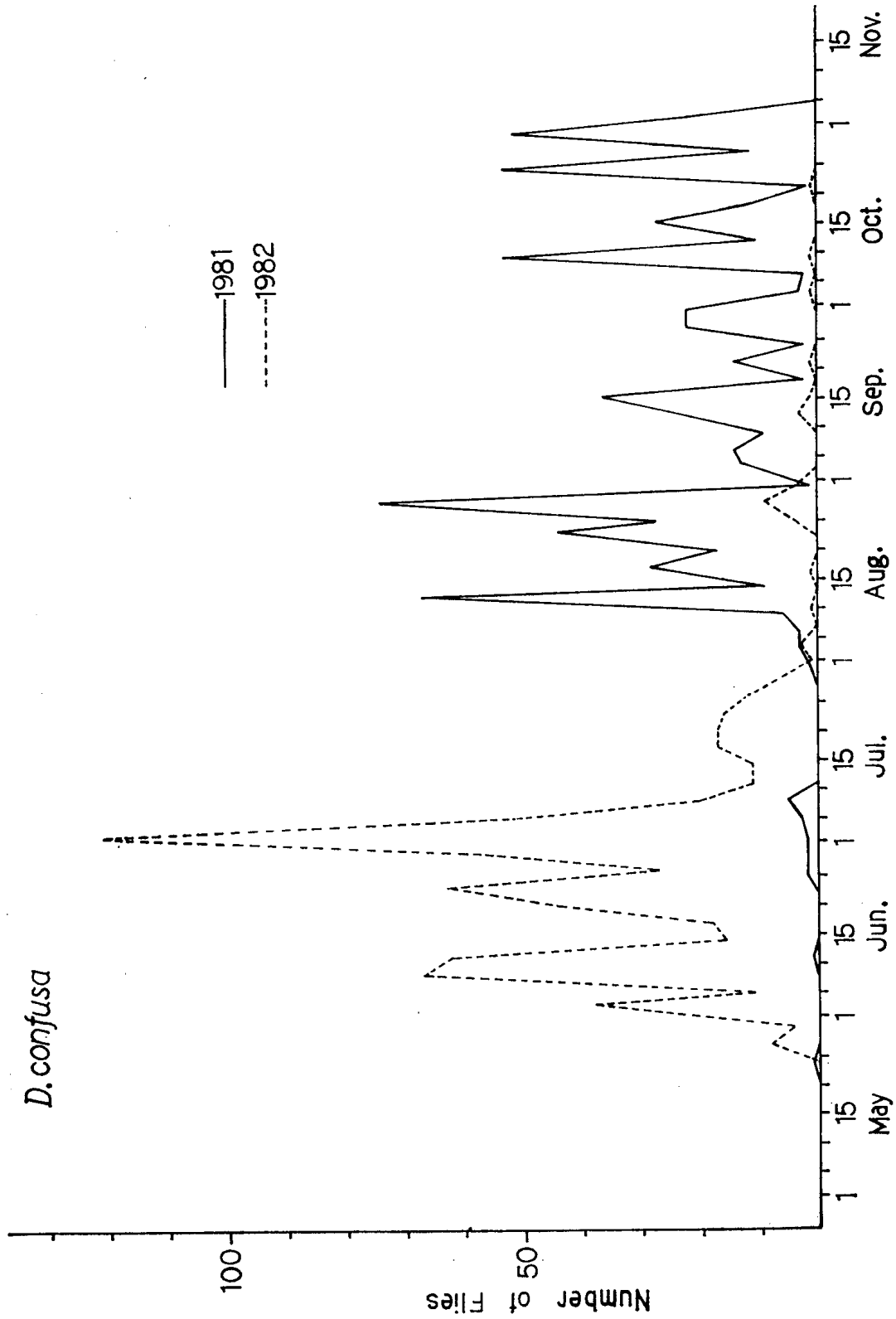


Fig 6. Illustrating the seasonal activity of *D. confusa* observed in Hamatonbetsu from 1981 to 1982.

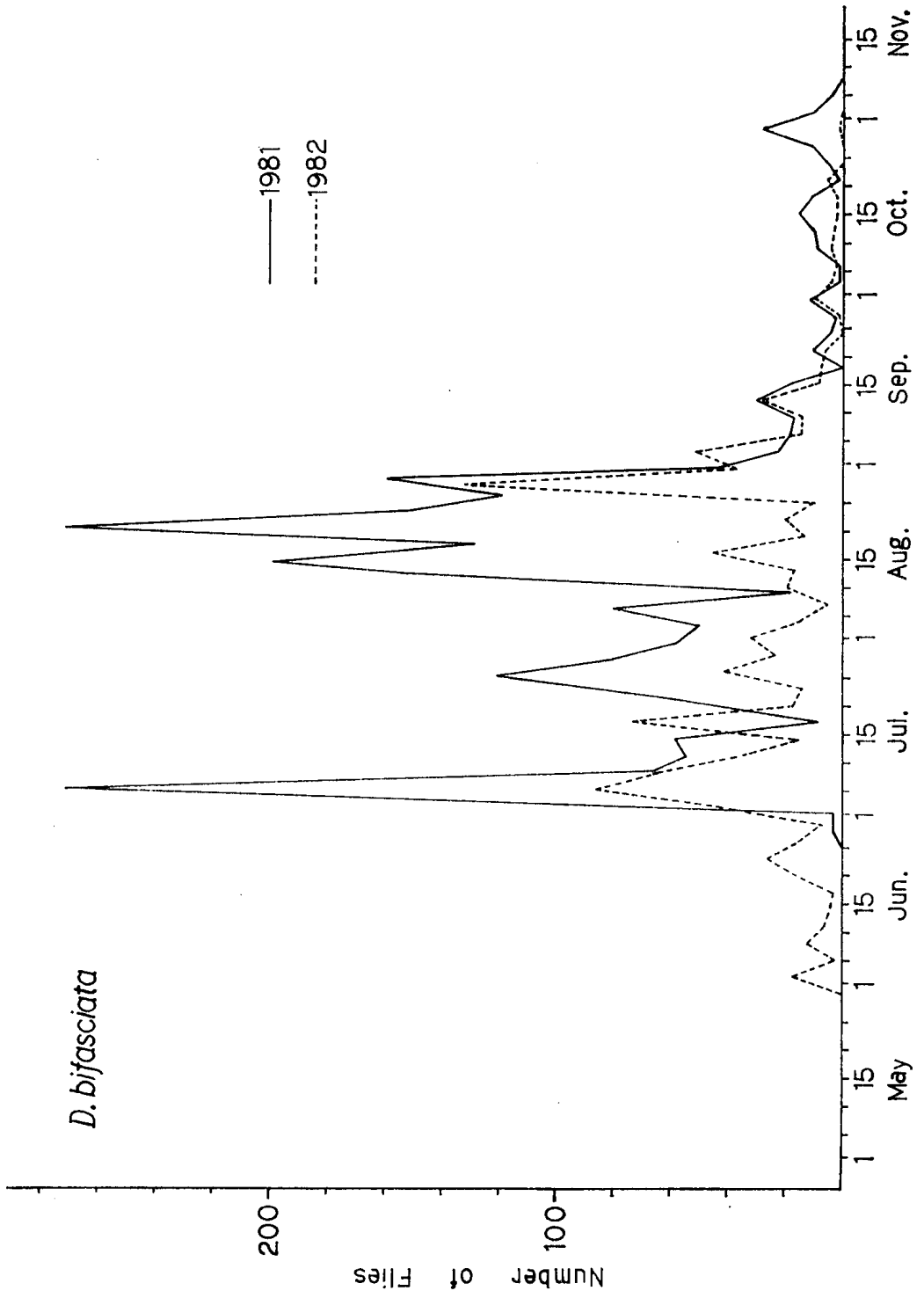


Fig. 7. Illustrating the seasonal activity of *D. bifasciata* observed in Hamatonbetsu from 1981 to 1982.

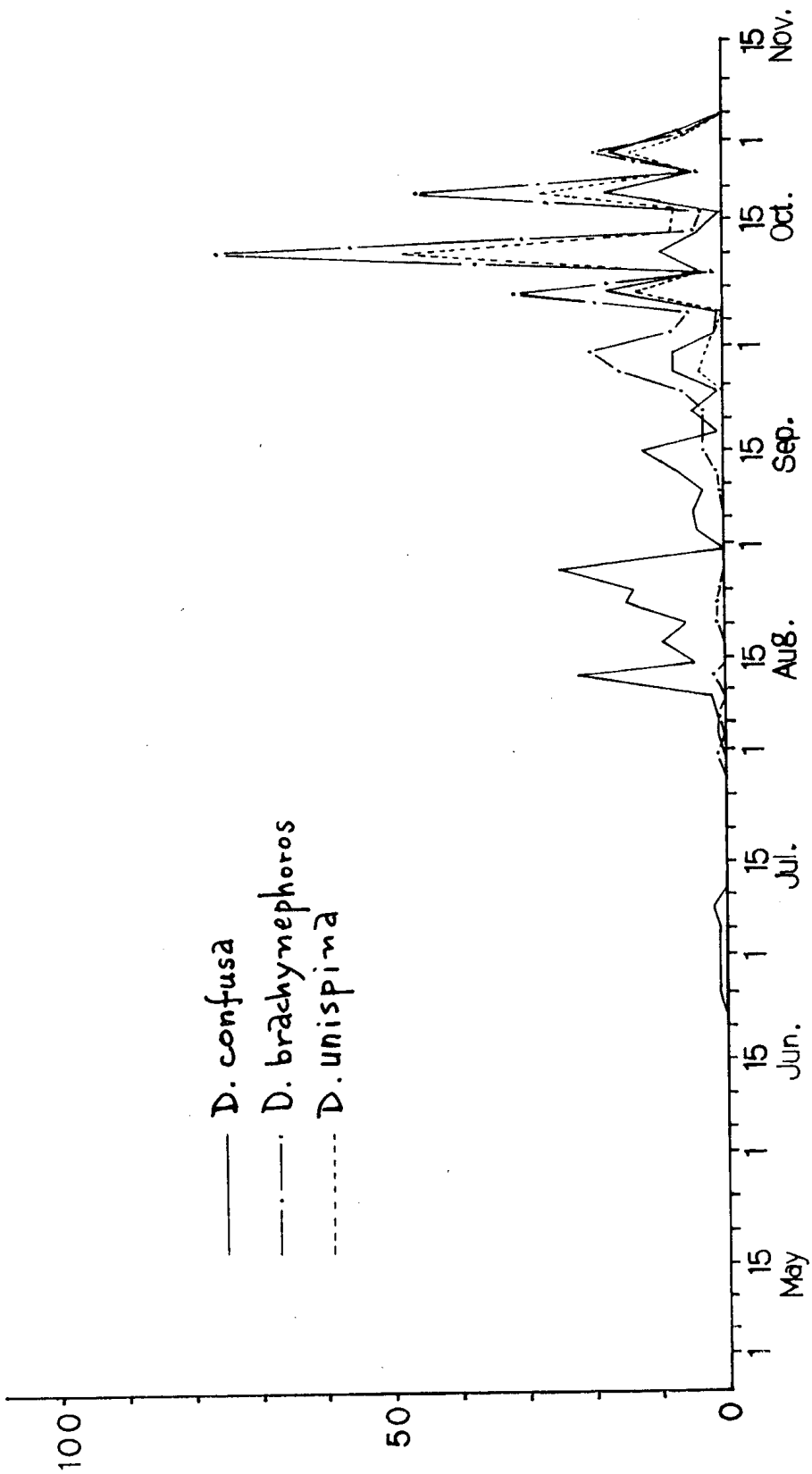


Fig. 8. Illustrating the seasonal activity of three species of Drosophila observed in Hamatonbetsu in 1981.

References

Beppu, K. 1976. Drosophila Survey of Hokkeido, XXXI. Microdistribution of drosophilid flies in the vicinity of the stream. Jour. of Fact. of sci., Hokkeido Univ., VI, Zool., 20, 2: 203-210.

———— 1978. Drosophila Survey of Hokkido, XXXV. Further study on Microdistribution of drosophilid flies in the vicinity of streams. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 21, 2: 155-164.

Ishihara, T. 1955. A perliminary study on diurnal activity of Drosophila in Hokkaido. Zool. Mag., 64, 3: 84-89 (in Japanese).

————————. Some aspects on the diurnal feeding behavior of Drosophila observed on Mt. Asahi (Hokkaido). Zool. Mag., 64, 3: 90-93 (in Japanese).

Kaneko, A. 1960. Drosophila Survey of Hokkaido, XVI. Some ecological notes on the attractiveness of different yeasts to drosophilid flies. Jour. of Fact. of Sci, Hokkaido Univ., VI, Zool., 14, 3: 493-498.

————. & T. Shima, 1962. Drosophila Survey of Hokkaido, XVIII. Drosophilidae from four localities of Hokkaido. Jour. of Fact. of Sci., Hokkaido Univ., VI, 15, 1: 74-79.

————, T. Tokumitsu & H. Takada, 1964. Drosophila Survey of Hokkaido, XX. Descrption of a new species, *Drosophila peudosordidula* sp. nov. Jour. of Fact. of Sci., Hokkaido Univ., VI, 15, 3: 375-394.

————, & H. Takada, 1966. Dsosophila Survey of Hokkaido, XXXI. Description of a new species, *D. neokadai* sp. nov. Annot. Zool. Japon., 39, 1: 55-59.

————, M. Kawakami & H. Takada, 1966. Dsosophila Survey of Hokkaido, XXIM. Drosophilid flies collected in Breweries. Jour. of Fact. of Sci., Hokkaido Univ., VI. Zool., 16, 1: 31-37.

————, T. Tokumitsu & T. Shima, 1968. Drosophila survey of Hokkaido, XXIV. On Drosophila collections of six localities in the southwestern part of Hokkaido. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 16, 3: 531-536.

————, 1968. Dsosophila Survey of Hokkaido, XXV. Some observations on summer diurnal activity of drosophilid flies in two localities of southwestern Hokkaido. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 16, 3: 537-541.

————, & T. Tokumitsu. 1969. Drosophila survey of Hokkaido,

XXVII. On drosophilid flies from seven localities of Hidaka district in southern Hokkaido. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 17, 1: 244-256.

————, E. Momma & T. Tokumitsu, 1969. Drosophila survey of Hokkaido, XXVIII. Dsosophilid flies from six localities of Northern Hokkaido. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 17, 2: 381. 385.

Kimura, M. T. 1976. Drosophila survey of Hokkaido. XXX. Microdistribution and seasonal fluctuations of drosophilid flies dwelling among the undergrowth plants. Jour. of East. of Sci., Hokkaido Univ., VI, Zool., 20, 2: 192-202;

————, 1976. Drosophila survey of Hokkaido, XXXII. A fleld survey of fungus preferences of drosophilid flies in Sapporo. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 20, 3: 288-298.

Momma, E. & H. Takada, 1954. Dsosophila survey of Hokkaido. I. Description of a new species, *D. alboralis* sp. nov. Annot. Zool. Japon., 27, 2: 97-101.

————, 1956. Drosophila survey of Hokkaido, IV. On a new member of robusta group common in woodlands. Annot. Zool. Japon., 29, 3: 171-173.

————, 1957. Drowophila Survey of Hokkaido, V. Distribution and habitats of drosophilid flies. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 13, 4: 93-98.

Okada. T. 1956. Systematic study of Drosophilidae and allied families of Japan. Gihodo Co.: 1-182.

Takada, H. 1952. Geographical variations in the wing indices of the drosophilid flies. Kagaku 22: 540-541 (in Japanese).

————, 1954. Two types of *D. auraria* with special regard to the difference in distribution by altitude. Jap. Jour. Genet., 29: 109-113 (in Japanese English résumé).

————, 1957. Some collections of Drosophila in Hokkaido through traps using fermenting fruits. Zool. Mag., 66, 4: 28-34 (In Japanese with English résumé).

————, & Okada, 1958. Drosophila survey of Hokkaido, VI. A new species of the *virilis* group of the genus Drosophila (Diptera). Jap. Jour. Zool., 12, 2: 133-137.

————, 1959. Drosophila survey of Hokkaido. IX. On *Drosophila*

okadai sp. nov. with supplementary notes on the female of *Scaptomyza polygonia* Okada. Annot. Zool. Japon., 32, 3: 152-155.

————, 1958. Drosophila survey of Hokkaido, X. Drosophilidae from several locatities of Hokkaido. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 14, 1: 120-127.

————, & T. Okada, 1960. Drosophila survey of Hokkaido, XI. A new species of Drosophila (Sophophora) from Japan. Annot. Zool. Japon., 33, 2: 142-145.

————, 1968. Drosophila Survey of Hokkaido, XXVI. Descriptions of three new species of Drosophilidae from Japan. Nour. of Fect. of General Educ., Sapporo Univ., 1: 119-127.

————, & M. J. Toda, 1973. Drosophila survey of Hokkaido, XXIX. On Amiota trochlea sp. nov. with supplementary notes on Diastatidae from Japan. Jour. of Fact. of Generel Educ., Sapporo Univ., 5: 1-4.

————, K. Beppu & M. J. Toda 1979. Drosophila survey of Hokkaido, XXXVI. New and unrecorded species of Drosophilidae (Diptera). Jour. of Fact. of General Educ., Sapporo Uniu., 14: 105-129.

————, 1971. Drosophila in Hokkaido, its Taxonomy and Ecology. Jour. of Fact. of General Educ., Sapporo Univ., 2: 15-30(in Japanese with English Résumé).

Toyofuku, Y. & Y. Kimura, 1961. Drosophila survey of Hokkaido, XIV. Distribution of drosophilid flies in Taisei-Mura, in the southwestern part of Hokkaido, in relation to the flora. Jap. Jour. Zool., 13, 1: 7-14.

Watabe, H. & K. Beppu, 1977. Drosophila Survey of Hokkaido, XXXIII. Ovarian development of Drosophila in relation to wild population. Jour. of Fact. of Sci., Hokkaido Univ., VI, Zool., 20, 4: 611-620.

————, 1977. Drosophila survey of Hokkaido, XXXIV. Seasonal variations of body color of *D. testacea*. Jour. Fact. of Sci., Hokkaido Univ., VI, Zool., 21, 1: 21-30.

————, & C. Higuchi, 1979. On a new species of the *virilis* group of the genus Drosophila (Diptera, Drosophilidae), with revision of the geographical distribution of the group. Annot. Zool. Japon., 52, 3: 203-211.

Wakahama, K., 1956. Drosophila survey of Hokkaido, III. Some flies new to Drosophila Fauna of Hokkaido. Annot. Zool. Japon., 29, 2:

116-119.

———————, & T. Okada, 1958. Drosophila survey of Hokkaido, VIII. Description of a new species of the genus *Amiota* (Drosophilidae) from Japan. Annot. Zool. Japon. 31, 2: 109-112.

———————, A. Kaneko & T. Tokumitsu, 1963. Drosophila survey of Hokkaido, XIX. Collection record in three localities of Hokkaido, with a note on the diurnal behavior of certain species. Annot. Zool. Japon., 36, 2: 92-96.